

Wind Me Up!

Solving Linear Equations Lesson
Linear Programming Unit
Algebra I or II
Paula Brault

Time: One 45 minute class

Pre-requisite Knowledge:

Solving one-step equations
Multiplication and division of variables
Group dynamics skills
Excel formula writing
For Extension: Linear Regression Steps

Objectives:

1. The student will learn how linear equations can be applied to everyday experiences.
2. Students will be able to use linear equations in everyday applications and review reorganization of an equation to solve for a particular variable.

Materials Needed:

Wind up cars
Stopwatch
Meter Stick/Yard Stick
Paper/Writing Implement
Microsoft Excel
Spreadsheet template
Instruction Sheet
Rubric
For Extension: TI Graphing Calculator

Important Vocabulary:

Linear Equation
Linear Regression
Distance
Time
Rate
Spreadsheet
Line of Best Fit

Procedure:

1. On the way into class, have each group of students takes a wind up car, stopwatch, and meter stick. Groups are determined the day before with a reminder on the board.
2. Say to students, "Today we will get wound up! We will review what we have learned about solving equations in Algebra I and use these equations to apply our knowledge to real-life situations."
3. Hand out and read through the directions and the rubric to ensure understanding.
4. Tell students, you have 10 minutes to complete the data collection part of this activity. If a student finishes before the end of the 10 minutes they may begin the computer work.

5. At the end of 10 minutes, ask students to move to the computers and enter data in an Excel spreadsheet and continue following directions on the instruction sheet.
6. Say, "This portion of the activity should take you 15 minutes to accomplish, don't forget to copy down your formulas to save time."
7. At end of class, collect printout of spreadsheet, graph, and rubric for grading.
8. At end of class, also ask students when they might use this in real life. Discuss if this is an easy formula to use in your head. Talk about how you can answer the ever popular question, "Are we there yet?"

Follow-up:

This activity leads into a discussion of Linear Programming. Come back to this activity frequently when moving on to Linear Programming as this is the simplest of programming formulas. One example is to return to the $d=rt$ formula when we want to know when two cars can rendezvous. Students should be able to use a simple linear equation and apply it to an everyday activity.

Assessment:

See attached rubric for assessment of the lesson. In addition, students will have a homework evaluation of the activities as well as questions on future quizzes.

Resources:

This is a revision of a project I created for my math methods class some 20 years ago. I have changed this several times over the years to match the topic at hand. Given this, there are no "resources" as such. I do wish to thank Portia Elliot at UMass-Amherst (now retired) for her inspiration for this project.

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Instructions



You are entering the exciting world of racing wind up cars. Your task is to test your car's speed without a speedometer. As with any data collecting situation, you will do multiple trials - in this case, 10 trials.

1. Create a starting line for your wind up car. This is the line you will pull your car back to, or place your car on once wound. Make sure there is at least one meter/yard of space beyond the starting line.
 2. Prepare your car for take off. Either pull your car back along the floor until it stops (effectively winding up the car) or manually wind up your car with the turnkey.
 3. Put your car on the starting line.
 4. Set your stopwatch to zero.
 4. Let your car go! Start the stopwatch simultaneously.
 5. When the car stops, leave it where it is and stop the stopwatch. Measure from the starting line to the car. Record the distance (in centimeters) and time on your datasheet.
 6. Repeat steps 1-5, 10 times.
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7. Set up an Excel spreadsheet to have the following columns: Distance, Time, Rate.
 8. Enter Distance and Time data.
 9. Create a formula that determines rate. (Don't forget you can copy down the formula and it will fill in all of your rates.
 10. Find the average rates using a formula at the bottom of the rate column.
 11. Select the data in Distance and Time column (select cells not columns).
 12. Click on graph button.
 13. Follow directions to create a scatter plot without lines and appropriately labeled axes.
 14. Turn in your handwritten data and Excel spreadsheet with scatter plot. Make sure your name is on all papers.

Extension Activity:

If you still have time left before time is called, take out a graphing calculator and find the equation of the line of best fit, given the data you collected.

Team Members: _____

Date _____

Period _____

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Data Collection

Trial #	Distance	Time

Name _____ Per. _____ Date _____

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Homework

1. In this experiment what is the independent and dependent variable?
2. Why did you run more than one trial?
3. What kind of correlation do you have on the graph you created in Excel?
4. On the back, write a complete, well thought out, paragraph summarizing this project. Include how each team member contributed to the project, what you learned, and what your team could have done to make the project better/easier.
5. What was difficult about this project? What was easy? What was fun?
6. What grade do you and your partner deserve based on the rubric you were given? Please defend your answer.

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Rubric

A score will be circled for each section. Scores are averaged and multiplied by 10 to get a total of 100 points.

Score	Participation	Behavior	Data Accuracy	Spreadsheet	Chart
10	You and your partner work consistently throughout the period all tasks completed in time indicated	Not spoken to about behavior	All Ten trials completed and accurate	Titles, data, and 3 formulas are accurate and formatted correctly.	Two correct labels for axes, title, 10 data points present, correct type of graph, and formatted correctly.
9	Data or Excel work not completed when time is called but partners work consistently (one piece missing)	N/A	All ten trials completed with one inaccuracy	Titles, data, and 3 formulas are accurate, however, not formatted correctly.	Two correct labels for axes, title, 10 data points present, correct type of graph, but not formatted correctly.
8	Tasks completed but work not distributed evenly between partners	Spoken to once about behavior	All ten trials completed with two inaccuracies	One element missing/inaccurate but formatted correctly.	One item missing but formatted correctly.
7	Tasks completed but one partner doesn't work.	N/A	All ten trials completed with three inaccuracies	One element missing/inaccurate but not formatted correctly.	One item missing but not formatted correctly.
6	Data or Excel work not completed when time is called and work not distributed evenly between partners (one piece missing)	Spoken to twice about behavior	5-9 trials completed and accurate	Two elements are missing/inaccurate but formatted correctly.	Two items missing but formatted correctly.
5	Data or Excel work not completed when time called and one partner is not working. (one piece missing)	N/A	5-9 trials completed with one inaccuracy	Two elements are missing/inaccurate but formatted incorrectly.	Two items missing but not formatted correctly.
4	Data and Excel work not completed but more than half is complete.	Spoken to three times about behavior	5-9 trials completed with two inaccuracies	Three elements are missing/inaccurate but formatted correctly.	Three items missing but formatted correctly.
3	Data and Excel work not completed with less than half is complete.	N/A	5-9 trials completed with three inaccuracies	Three elements are missing/inaccurate but formatted incorrectly.	Three items missing but not formatted correctly.
2	N/A	Asked to sit in the hallway to take a break	1-4 trials completed and accurate	Four elements are missing/inaccurate but formatted correctly.	Four items missing but formatted correctly.
1	N/A	N/A	1-4 trials completed with inaccuracies	Four elements are missing/inaccurate but formatted correctly.	Four items missing but not formatted correctly.
0	Data and Excel not attempted	Asked to go to the office.	no trials completed	All elements missing.	All items missing.